

wherein  $R^2$  and  $R^3$  are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and  $R^4$  is an alkylene group containing 1-21 carbon atoms;

m is an integer of at least 1, having an average of 4-20;

$A^1$  is an alkylene group containing 3 or 4-carbon atoms; and

n is 0 or an integer of at least 1, having an average of 0-15; wherein  $(C_2H_4O)$  and  $(A^1O)$ , in case of the average of n being 1-15, are linked random-wise and/or block-wise; with

(II) at least one selected from the group consisting of a quinone type digestion assistant and a polysulfide.

2. (Twice Amended) An assistant for digesting a lignocellulose material, which comprises a combination of:

(I) a nonionic surfactant (B) obtained by addition of an alkylene oxide to an aliphatic alcohol, said nonionic surfactant (B) comprising one or more compounds represented by the general formula (3):



wherein  $R^5$  is a straight-chain, branched or cyclic aliphatic hydrocarbyl group containing 4-24 carbon atoms;

p is an addition molar number of 4-20;

$A^2$  is an alkylene group containing 3 or 4 carbon atoms; and

q is an addition molar number of 0 or 1-15; wherein  $(C_2H_4O)$  and  $(A^2O)$ , in case of the average of q being 1-15, are linked random-wise and/or block-wise; said nonionic

surfactant (B) having a weight-average molecular weight (Mw) and a number-average molecular weight (Mn) providing a ratio of Mw/Mn satisfying the relationship

$$Mw/Mn \leq -0.183 \times K^{-0.930} \times \ln X + 1.327 \times K^{-0.065} \quad (4)$$

wherein  $\ln X$  is a natural logarithm of X;

X is an average addition molar number of the alkylene oxide per 1 mole of the aliphatic alcohol; and

K is the number of carbon atoms in  $R^5$  of the general formula (3); with

(II) at least one selected from the group consisting of a quinone type digestion assistant and a polysulfide.

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5. (Twice Amended) An assistant for digesting a lignocellulose material, which comprises:

(a) at least one nonionic surfactant selected from the group consisting of a nonionic surfactant (A) and a nonionic surfactant (B); together with

(b) at least one anionic surfactant selected from the group consisting of an anionic surfactant (C), an anionic surfactant (D) and anionic surfactant (E);

in a weight ratio of 100/0.1 - 100/30;

said nonionic surfactant (A) comprising one or more compounds represented by the general formula (1); said nonionic surfactant (B) being obtained by addition of an alkylene oxide to an aliphatic alcohol and comprising one or more compounds represented by the general formula (3) and having a weight-average molecular weight (Mw) and a number-average molecular weight (Mn) providing a ratio of Mw/Mn satisfying the relationship (4); said anionic surfactant (C) comprising one or more

compounds represented by the general formula (5); said anionic surfactant (D) comprising one or more compounds represented by the general formula (6); and said anionic surfactant (E) comprising one or more compounds represented by the general formula (7):



wherein  $R^1$  is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



wherein  $R^2$  and  $R^3$  are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and  $R^4$  is an alkylene group containing 1-21 carbon atoms,  $R^5$  and  $R^6$  are straight-chain, branched or cyclic aliphatic hydrocarbyl groups containing 4-24 carbon atoms;  $R^7$  is a straight-chain or branched alkyl group, alkenyl group, or mono- or di-hydroxyalkyl group, containing 4-24 carbon atoms;  $R^8$  is an alkylene group containing 1-6 carbon atoms; m is an integer of at least 1, having an average of 4-20; p is a number of 4-20;  $A^1$ ,  $A^2$ ,  $A^3$  and  $A^4$  are alkylene groups containing 3 or 4 carbon atoms; n, r and s are 0 or an integer, of at least 1, having an average of 0-15; q is an addition molar number of 0 or 1-15; k is an

integer of 1 or 2; M<sup>1</sup>, M<sup>2</sup> and M<sup>3</sup> monovalent cations; wherein (C<sub>2</sub>H<sub>4</sub>O) and (A<sup>1</sup>O) , or (C<sub>2</sub>H<sub>4</sub>O) and (A<sup>2</sup>O), in case of the average of n or q being 1-15, are linked random-wise and/or block-wise;

$$Mw/Mn \leq -0.183xK^{-0.930} \times \ln X + 1.327xK^{-0.065} \quad (4)$$

wherein LnX is a natural logarithm of X; X is an average addition molar number of the alkylene oxide per 1 mole of the aliphatic alcohol; and K is the number of carbon atoms in R<sup>5</sup> of the general formula (3).

7. (Twice Amended) A method for producing a pulp, which comprises digesting a lignocellulose material with an alkali or a sulfite in the presence of a digestion assistant; said assistant comprising at least one assistant (I) selected from the group consisting of:

(A) a nonionic surfactant comprising one or more compounds represented by the general formula (1):



(B) a nonionic surfactant, obtained by addition of an alkylene oxide to an aliphatic alcohol, comprising one or more compounds represented by the general formula (3):



and having a weight-average molecular weight (Mw) and a number-average molecular weight (Mn) providing a ratio of Mw/Mn satisfying the relationship (4);

$$Mw/Mn \leq -0.183xK^{-0.930} \times \ln X + 1.327xK^{-0.065} \quad (4);$$

(C) an anionic surfactant comprising one or more compounds represented by the general formula (5):



(D) an anionic surfactant comprising one or more compounds represented by the general formula (6):



wherein  $R^1$  is a branched alkyl group containing 4-24 carbon atoms represented by the general formula (2):



wherein  $R^2$  and  $R^3$  are independently selected from the group consisting of straight-chain or branched alkyl groups containing 1-21 carbon atoms, and  $R^4$  is an alkylene group containing 1-21 carbon atoms;  $R^5$  and  $R^6$  are straight-chain, branched or cyclic aliphatic hydrocarbyl groups containing 4-24 carbon atoms;  $m$  is an integer of at least 1, having an average of 4-20;  $p$  is a number of 4-20;  $A^1$ ,  $A^2$  and  $A^3$  are alkylene groups containing 3 or 4 carbon atoms;  $n$  and  $r$  are 0 or an integer of at least 1, having an average of 0-15;  $q$  is an addition molar number of 0 or 1-15;  $k$  is an integer of 1 or 2;  $M^1$  and  $M^2$  are monovalent cations wherein  $(C_2H_4O)$  and  $(A^1O)$ , or  $(C_2H_4O)$  and  $(A^2O)$ , in case of the average of  $n$  or  $q$  being 1-15, are linked random-wise and/or block-wise;  $\ln X$  is a natural logarithm of  $X$ ;  $X$  is an average addition molar number or the alkylene oxide per 1 mole of the aliphatic alcohol; and  $K$  is the number of carbon atoms in  $R^5$  of the general formula (3).